

What is claimed is:

1. A method of vehicle collision avoidance using satellite
5 navigational signals and direct radio communication
comprising the steps of:

10 determining a first vehicle position with a
plurality of satellite navigation signals;

determining a second vehicle position with a
plurality of satellite navigation signals;

15 encoding and transmitting a direct radio messages
that includes said first vehicle identification and
position;

20 receiving and decoding a direct radio message that
includes said second vehicle identification and
position;

25 determining by relative vehicle positions and
headings an evasive maneuver to keep said vehicles
separated a predetermined distance.

2. The method of claim 1 further comprising the steps of:

30 encoding and transmitting a direct radio message
that includes said first vehicle evasive maneuver;

3. The method of claim 2 further comprising the steps of:

35 receiving and decoding a direct radio message that
includes said second vehicle evasive maneuver.

7. A method of vehicle collision avoidance using navigational satellite signals and direct radio wave communication comprising the steps of:

5

determining a fixed position with a plurality of navigational signals;

10

encoding and transmitting a direct radio message that includes said fixed position;

receiving and decoding said direct radio message;

15

determining by vehicle position and heading an evasive maneuver to direct said vehicle away from said fixed position.

8. The method of claim 7 further comprising the steps of:

20

displaying the relative bearing and distance of said fixed position on a display unit wherein: said fixed position marks a navigation obstacle and navigation marker.

25

9. The method of claim 7 wherein:

30

said encoding and transmitting a direct radio message that includes said fixed position includes a unique identification code and code representing the type of navigational hazard;

35

said vehicle position is determined from a plurality of satellite navigation signals. "

4. The method of claim 1 further comprising the steps of:

displaying the relative position of said vehicles
as a graphic representation showing the relative bearing
and distance on a display unit.

synthesizing an audio alert that informs the pilot
of said evasive maneuver.

5. The method of claim 1 wherein:

said vehicle is an aircraft;

said satellite navigation signals are from earth
based pseudo-satellites;

said evasive maneuver is a directive to change the
altitude of said vehicles.

6. The method of claim 1 wherein:

said vehicle is a sea going vessel;

said satellite navigation signals are from earth
based pseudo-satellites;

said evasive maneuver is a directive to change the
course of said vehicle.

10. The method of claim 7 further comprising the steps of:

encoding and transmitting said evasive maneuver;

5 receiving and decoding an evasive maneuver
confirmation signal.

11. An apparatus for vehicle collision avoidance with
10 other like equipped vehicles using satellite navigation
signals and a direct radio wave message comprising:

a satellite receiver for receiving satellite
navigation signals;

15 a control program to format the direct radio wave
message and determine an evasive maneuver;

a computer electrically connected to said satellite
20 receiver for processing signals from said satellite
receiver and executing said control program;

a modem electrically connected to said computer for
transmitting and receiving the direct radio wave message
25 from the other like equipped vehicles;

a transceiver electrically connected to said modem
to transmit and receive data.

30 12. The apparatus of claim 11 further comprising:

a display unit electrically connected to said
computer to display the relative bearing and distance of
35 the equipped vehicles;

an audio interface electrically connected to said computer to synthesize audio alarms;

5 a control unit electrically connected to said computer to program and control the collision avoidance apparatus.

10 13. The apparatus of claim 12 wherein:

said direct radio message is a time division multiple access protocol message;

15 said modem is synchronized to said satellite receiver clock.

14. The apparatus of claim 11 wherein:

20 said direct radio message is a time division multiple access protocol message;

25 said modem is synchronized to said satellite receiver clock.

15. The apparatus of claim 11 wherein:

30 said computer comprises: a first microprocessor for satellite signal processing electrically connected to a second microprocessor for executing the control program.

16. The apparatus of claim 15 further comprising:

5 a third microprocessor electrically connected
between said second microprocessor and said modem for
executing the direct radio wave communication protocol.

17. The apparatus of claim 11 wherein:

10

said direct radio wave is a skywave; and

said satellite navigation signals are from ground
based pseudo-satellites.

15